

# V&V Reference Report

## L2 ASCDS Version : 8.4.5

Observation 1509 - L2 Version 4  
Chandra X-Ray Center

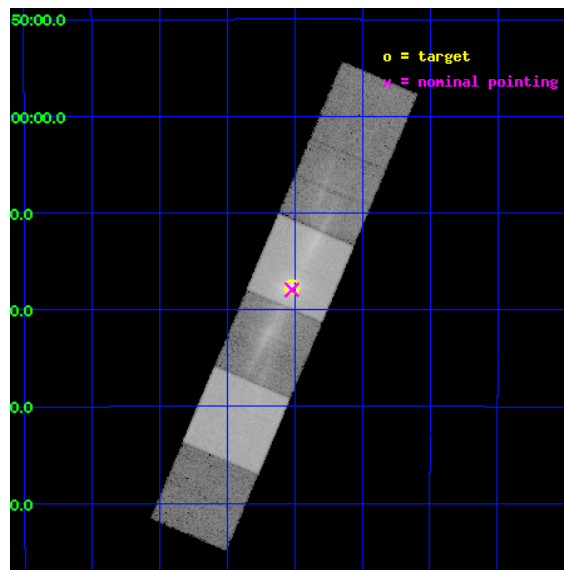
L2 Processing Date : Aug 24 2012

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# 1 Front

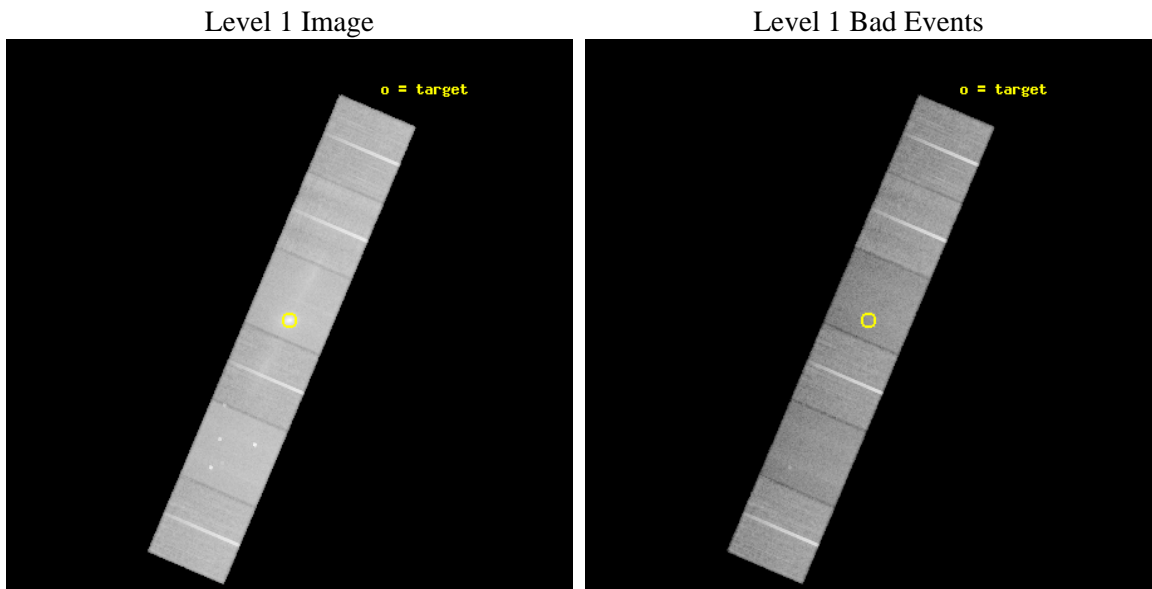
|          |  |   |
|----------|--|---|
| seq_num  | 800018   | Sequence number                             |
| obs_id   | 1509   | Observation id                              |
| title    | HIGH RESOLUTION X-RAY SPECTRA OF CLUSTER COOLING FLOWS | Proposal ti                                 |
| observer | Prof Claude Canizares                                  | Principal investigator                      |
| object   | PKS 0745-191   | Source name                                 |
| dtcycle  | 0  | &#160                                       |
| cycle    | P  | events from which exps?<br>Prim/Second/Both |
| ra_targ  | 116.880417   | Observer's specified target RA [deg]        |
| dec_targ | -19.294444   | Observer's specified target Dec [deg]       |
| ra_nom   | 116.88043026951  | Nominal RA [deg]                            |
| dec_nom  | -19.299210886545                                       | Nominal Dec [deg]                           |
| roll_nom | 293.00191556984  | Nominal Roll [deg]                          |
| revision | 4  | Processing version of data                  |
| ontime   | 39900.835533619  | Sum of GTIs [s]                             |
| livetime | 39395.587128694  | Livetime [s]                                |
| ontime4  | 39910.599574015  | Sum of GTIs [s]                             |
| ontime5  | 39907.277251691  | Sum of GTIs [s]                             |
| ontime6  | 39907.236311421  | Sum of GTIs [s]                             |
| ontime7  | 39900.835533619  | Sum of GTIs [s]                             |
| ontime8  | 39907.194374025  | Sum of GTIs [s]                             |
| ontime9  | 39907.153334022  | Sum of GTIs [s]                             |
| l2events | 516091   | Number of level 2 events                    |



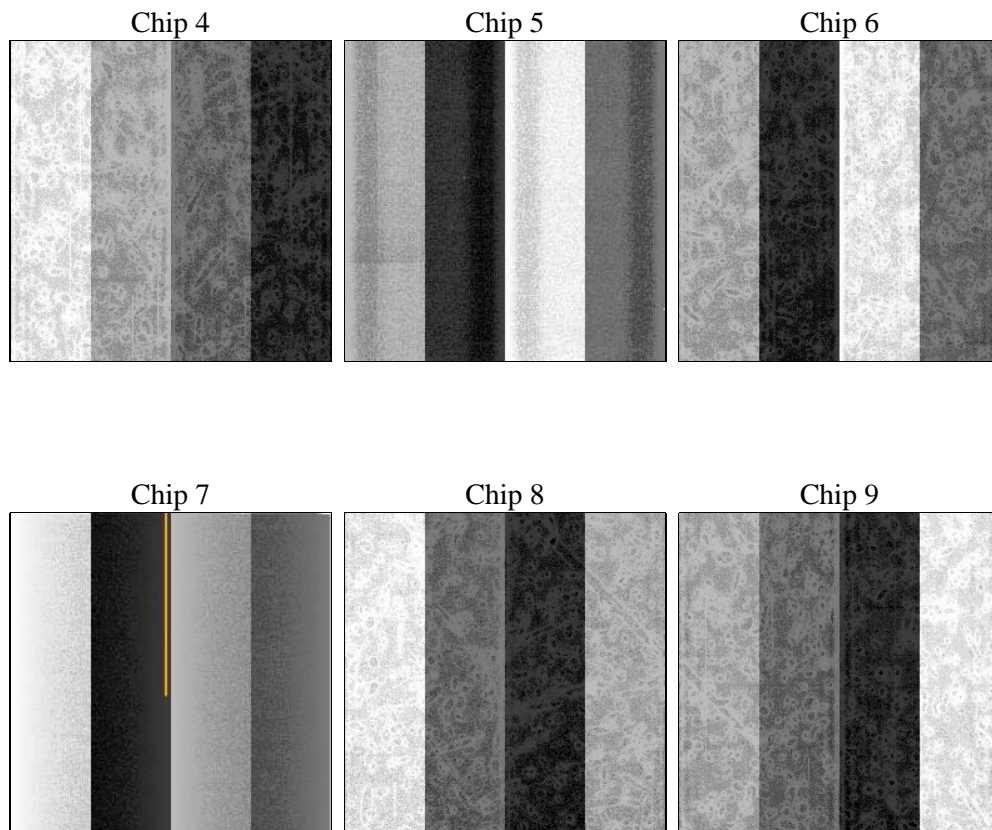
## 2 OBI

### 2.1 OBI

#### 2.1.1 Images



#### 2.1.2 Bias



### 2.1.3 Parameters

|          |                     |                                |                |                 |   |
|----------|---------------------|--------------------------------|----------------|-----------------|---|
| obi_num  | 0                   | Obi number                     | sched_exp_time | 40400.000000    | [s] Scheduled observation exposure time |
| ascdsver | 8.4.5               | Processing system revision     | ontime         | 39900.835533619 | Sum of GTIs [s]                         |
| caldbver | 4.5.1.1             | &#160                          | ontime4        | 39910.599574015 | Sum of GTIs [s]                         |
| date     | 2012-08-24T04:43:16 | Date and time of file creation | ontime5        | 39907.277251691 | Sum of GTIs [s]                         |
| revision | 4                   | Processing version of data     | ontime6        | 39907.236311421 | Sum of GTIs [s]                         |
|          |                     |                                | ontime7        | 39900.835533619 | Sum of GTIs [s]                         |
|          |                     |                                | ontime8        | 39907.194374025 | Sum of GTIs [s]                         |
|          |                     |                                | ontime9        | 39907.153334022 | Sum of GTIs [s]                         |
|          |                     |                                | l1events       | 2096066         | Number of level 1 events                |

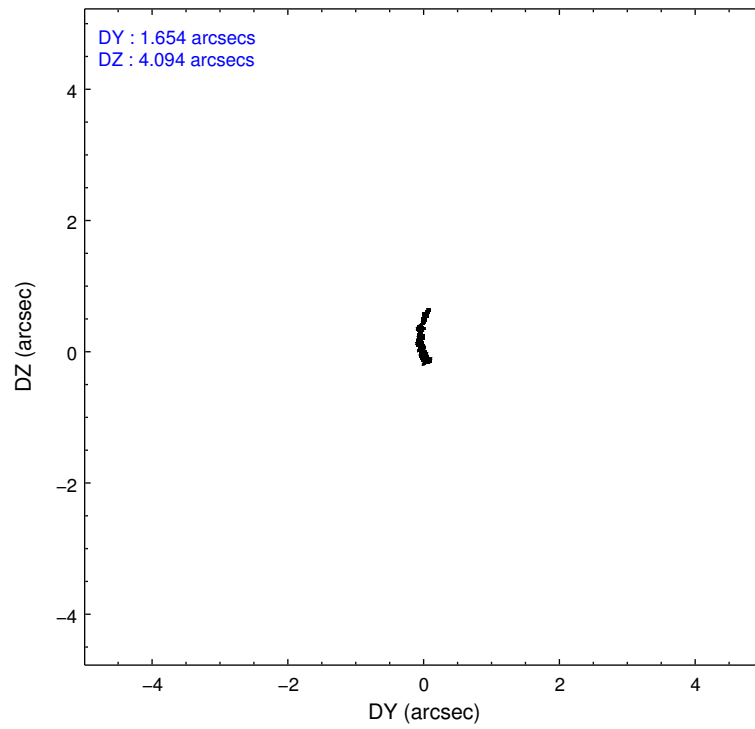
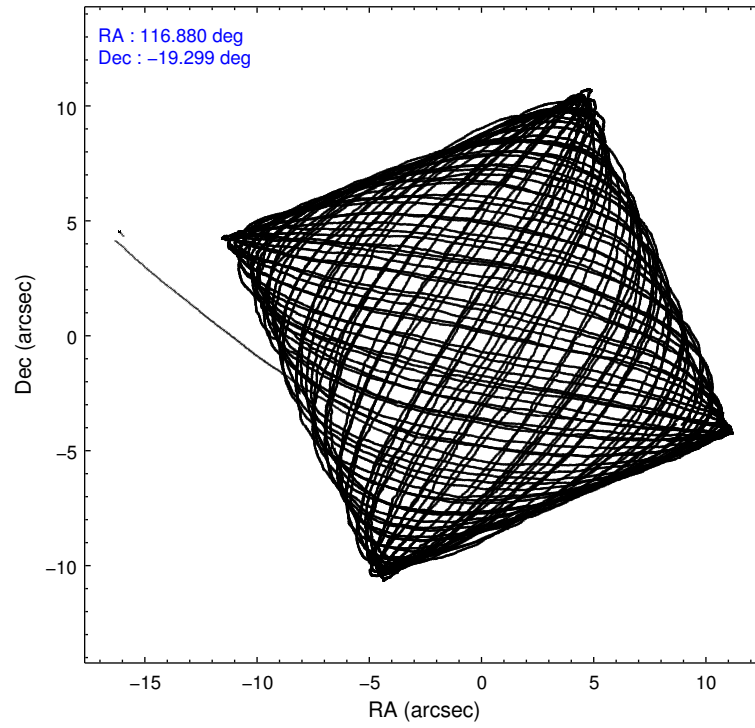
### 2.1.4 Events

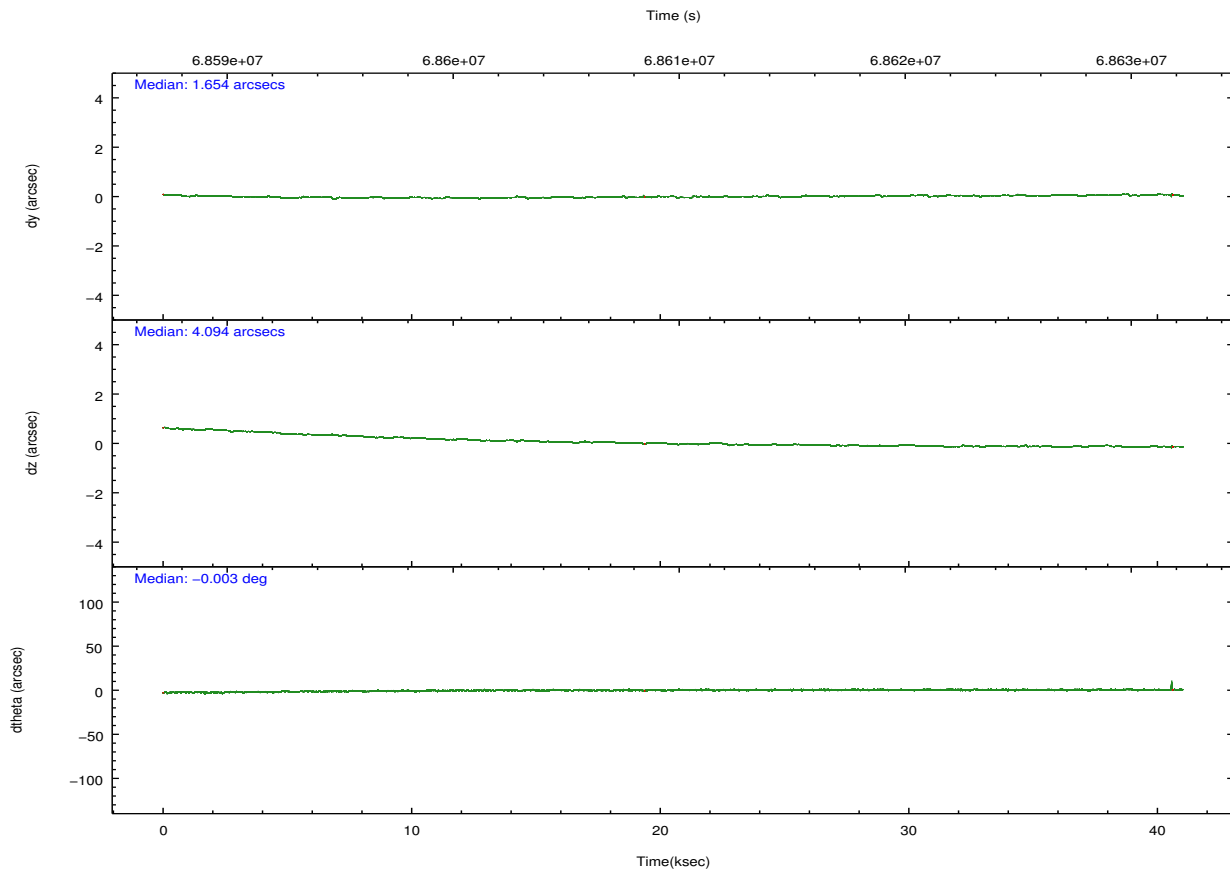
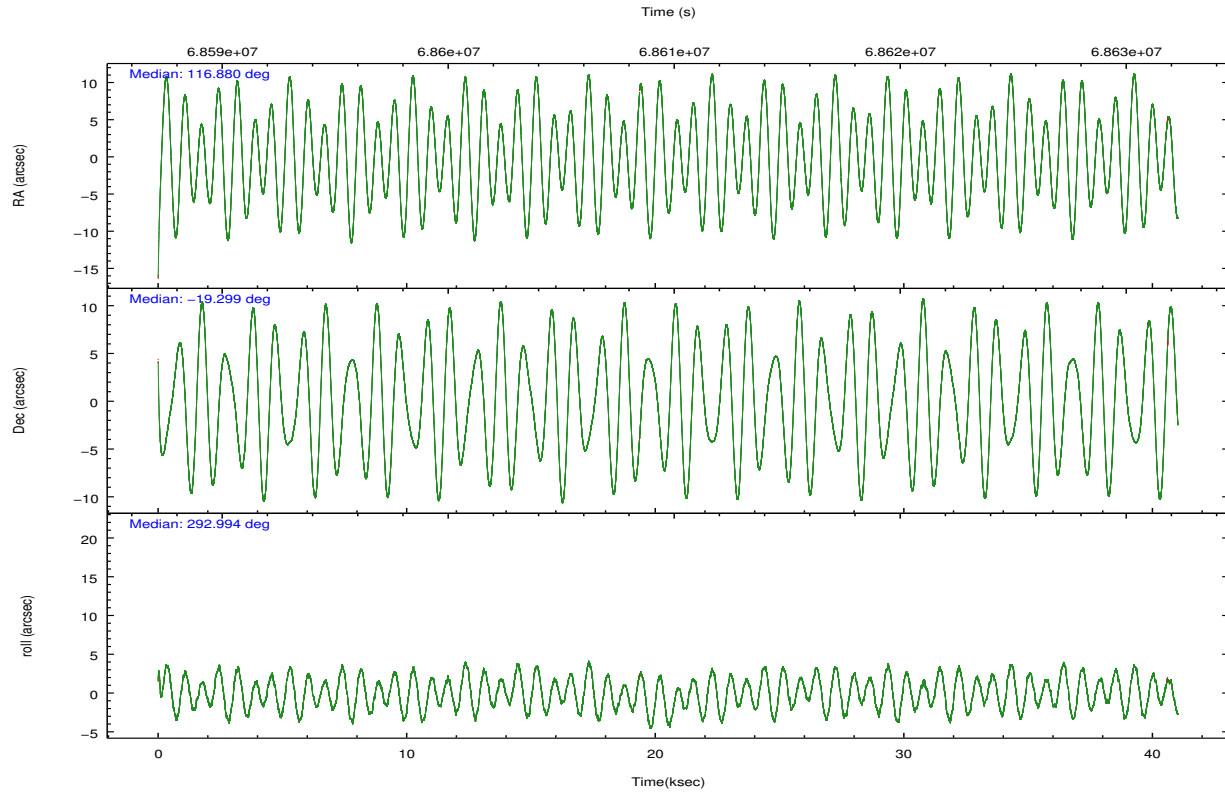
|                 | ccd 4  | ccd 5  | ccd 6  | ccd 7  | ccd 8  | ccd 9  |                | ccd 4  | ccd 5  | ccd 6  | ccd 7  | ccd 8  | ccd 9  |
|-----------------|--------|--------|--------|--------|--------|--------|----------------|--------|--------|--------|--------|--------|--------|
| level 1 events  | 327658 | 376357 | 322497 | 405302 | 371097 | 293155 | grade 0 events | 14316  | 19400  | 32202  | 28416  | 29676  | 14558  |
| rejected events | 294660 | 199798 | 266116 | 196070 | 293738 | 259577 |                | 4%     | 5%     | 9%     | 7%     | 7%     | 4%     |
| rejected %      | 89%    | 53%    | 82%    | 48%    | 79%    | 88%    | grade 1 events | 146    | 463    | 195    | 368    | 231    | 134    |
|                 |        |        |        |        |        |        |                | 0%     | 0%     | 0%     | 0%     | 0%     | 0%     |
|                 |        |        |        |        |        |        | grade 2 events | 7434   | 51563  | 8911   | 44754  | 15622  | 6549   |
|                 |        |        |        |        |        |        |                | 2%     | 13%    | 2%     | 11%    | 4%     | 2%     |
|                 |        |        |        |        |        |        | grade 3 events | 2978   | 8296   | 4269   | 20819  | 7664   | 3329   |
|                 |        |        |        |        |        |        |                | 0%     | 2%     | 1%     | 5%     | 2%     | 1%     |
|                 |        |        |        |        |        |        | grade 4 events | 3017   | 7649   | 4133   | 20785  | 6918   | 3235   |
|                 |        |        |        |        |        |        |                | 0%     | 2%     | 1%     | 5%     | 1%     | 1%     |
|                 |        |        |        |        |        |        | grade 5 events | 9131   | 28873  | 11012  | 33107  | 13512  | 10825  |
|                 |        |        |        |        |        |        |                | 2%     | 7%     | 3%     | 8%     | 3%     | 3%     |
|                 |        |        |        |        |        |        | grade 6 events | 5267   | 89725  | 6888   | 94538  | 17506  | 5922   |
|                 |        |        |        |        |        |        |                | 1%     | 23%    | 2%     | 23%    | 4%     | 2%     |
|                 |        |        |        |        |        |        | grade 7 events | 285369 | 170388 | 254887 | 162515 | 279968 | 248603 |
|                 |        |        |        |        |        |        |                | 87%    | 45%    | 79%    | 40%    | 75%    | 84%    |

## 2.2 Compared Parameters

| Parameter                         | Planned             | Actual               | Parameter                             | Planned   | Actual  |
|-----------------------------------|---------------------|----------------------|---------------------------------------|-----------|---------|
| Instrument                        | ACIS                | ACIS                 | Obspar format version number          | 7         | 7       |
| Detector                          | ACIS-456789         | ACIS-456789          | Obspar file type                      | PREDICTED | ACTUAL  |
| Grating                           | HETG                | HETG                 | Obspar update status                  | NONE      | UPDATED |
| Data mode                         | FAINT               | FAINT                | Number of optional ACIS chips dropped | 0         | 0       |
| Observation mode                  | POINTING            | POINTING             | On-chip summing requested             | N         | N       |
| [deg] Pointing RA                 | 116.857172          | 116.8804302695125    | Subarray requested                    | NONE      | NONE    |
| [deg] Pointing Dec                | -19.282704          | -19.29921088654465   | Alternating exposures requested       | N         | N       |
| [deg] Pointing Roll               | 292.837600          | 293.0019155698436    | [s] Primary exposure time             | 0.000000  | 3.2     |
| [mm] SIM focus pos                | -0.684267           | -0.6828225247311905  |                                       |           |         |
| [mm] SIM defocus                  | 0                   | 0.001444936568705701 |                                       |           |         |
| [mm] SIM translation stage pos    | -190.132523         | -190.1400660498719   |                                       |           |         |
| [mm] SIM translation stage offset | 0                   | 0.00754346686406393  |                                       |           |         |
| [s] Observation start time (MET)  | 68589688.184000     | 68588323.17755499    |                                       |           |         |
| Observation start date            | 2000-03-04T20:40:24 | 2000-03-04T20:18:43  |                                       |           |         |
| [s] Observation end time (MET)    | 68630088.184000     | 68631014.941613      |                                       |           |         |
| Observation end date              | 2000-03-05T07:53:44 | 2000-03-05T08:10:14  |                                       |           |         |
| Read mode                         | TIMED               | TIMED                |                                       |           |         |

## 2.3 Aspect



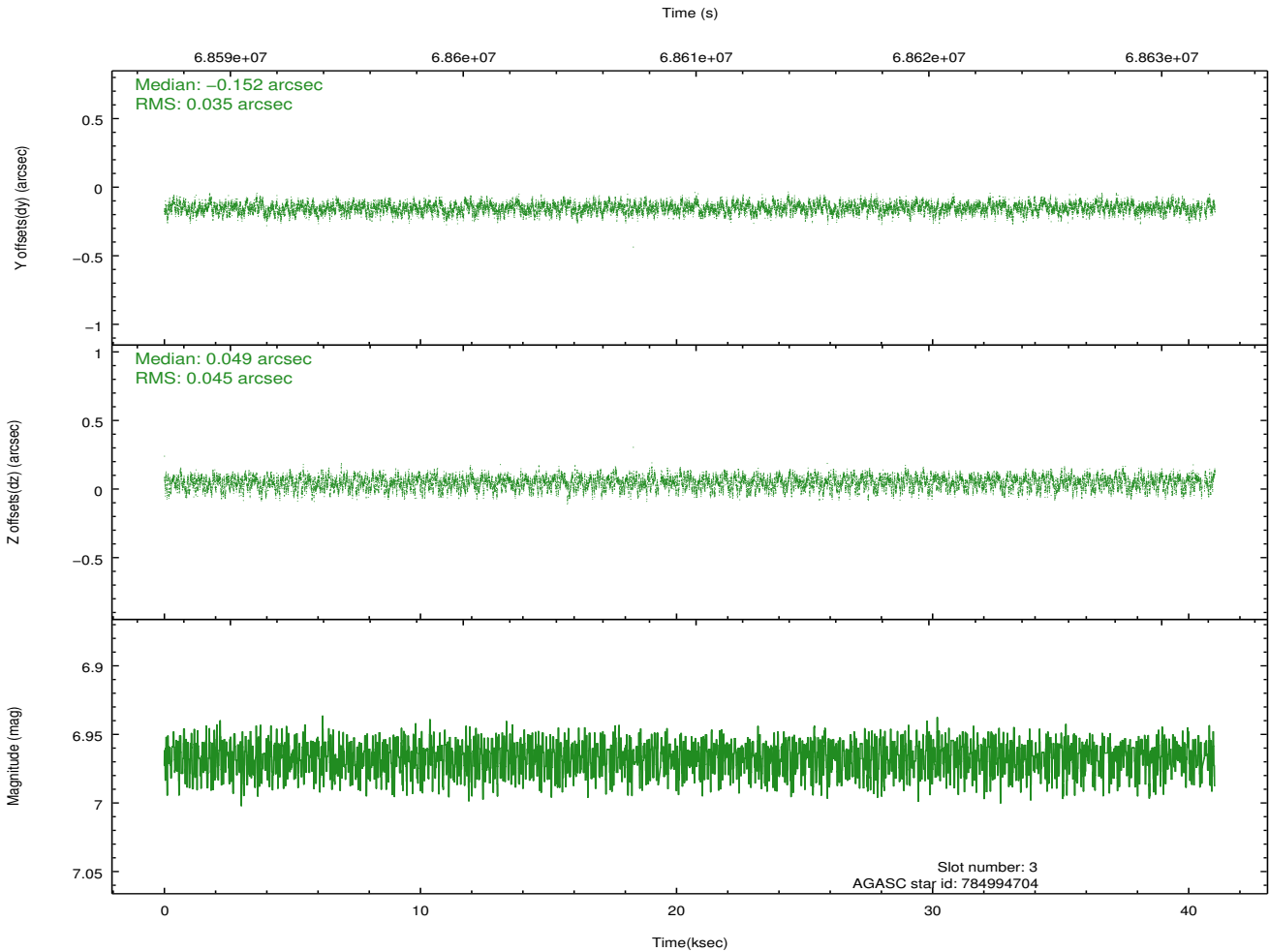
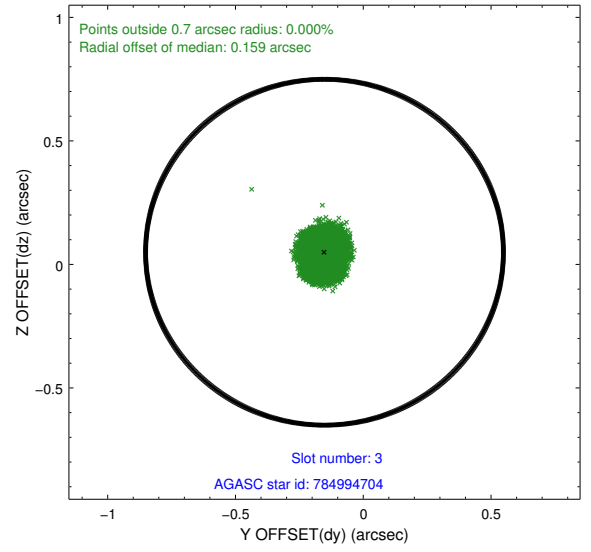
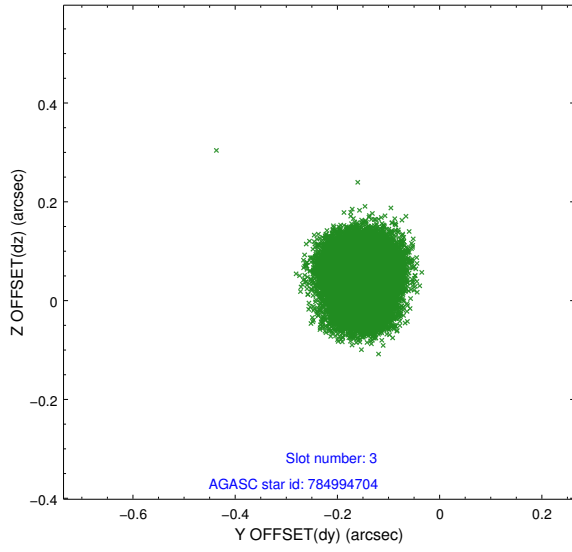


### Slot Statistics

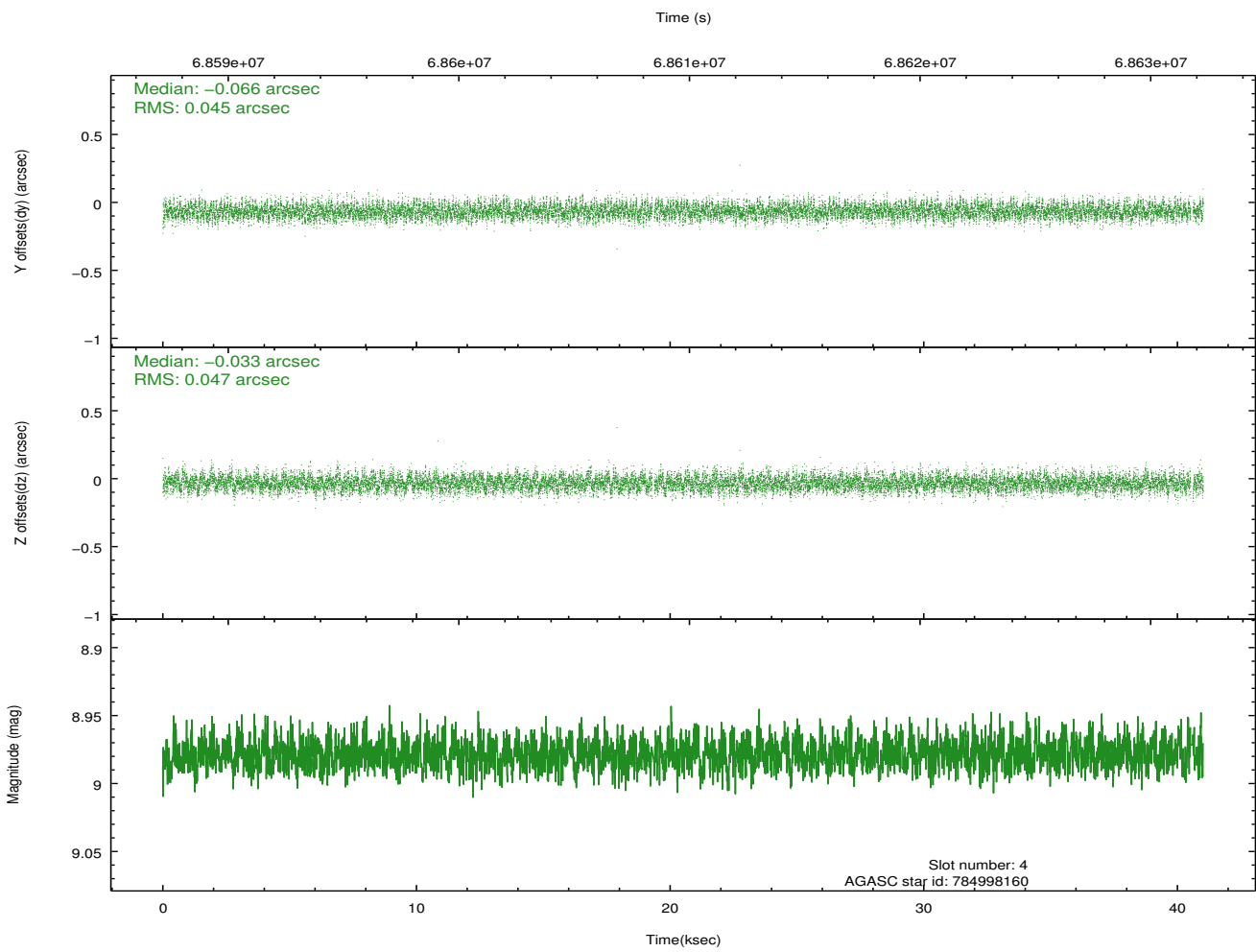
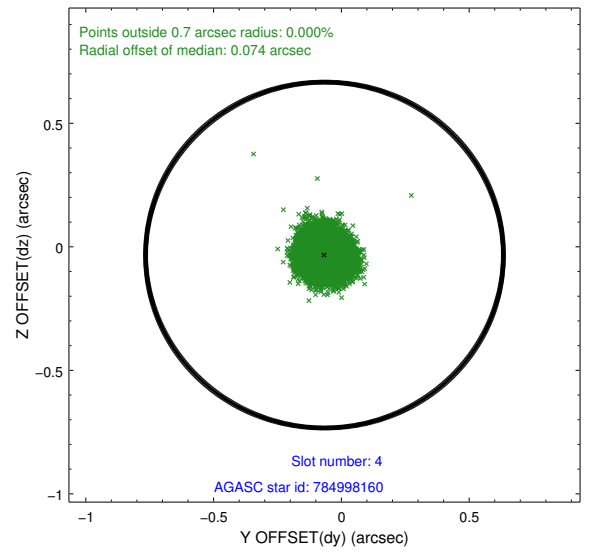
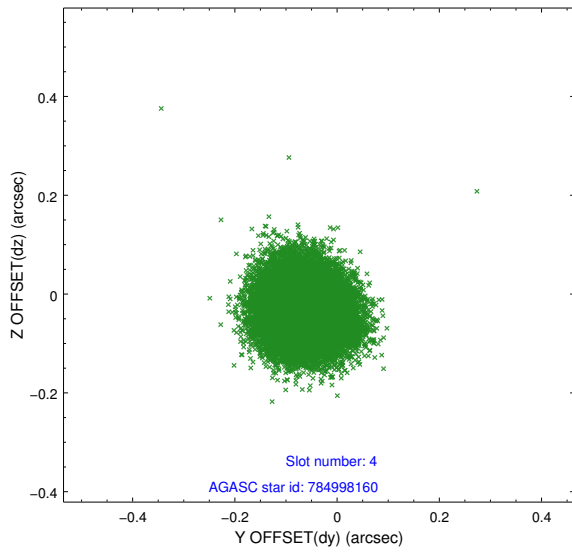
| slot | status | id        | mag  | n_pts | med_dy | med_dz | dr1   | dr2   | ra         | dec        | mean_y   | mean_z   |
|------|--------|-----------|------|-------|--------|--------|-------|-------|------------|------------|----------|----------|
| 0    | FID    | ACIS-S-2  | 7.11 | 9971  | -0.018 | -0.018 | 0.009 | 0.015 | 0.000000   | 0.000000   | -754.30  | -1725.27 |
| 1    | FID    | ACIS-S-4  | 7.21 | 9971  | 0.007  | 0.014  | 0.007 | 0.012 | 0.000000   | 0.000000   | 2159.02  | 183.20   |
| 2    | FID    | ACIS-S-5  | 7.23 | 9971  | -0.020 | 0.013  | 0.008 | 0.014 | 0.000000   | 0.000000   | -1807.10 | 176.94   |
| 3    | GUIDE  | 784994704 | 6.97 | 19927 | -0.152 | 0.049  | 0.062 | 0.096 | 116.488404 | -18.904531 | -1740.79 | -629.54  |
| 4    | GUIDE  | 784998160 | 8.98 | 19924 | -0.066 | -0.033 | 0.069 | 0.110 | 117.375733 | -18.842479 | -772.68  | 2242.50  |
| 5    | GUIDE  | 785013312 | 8.98 | 19923 | 0.081  | 0.004  | 0.089 | 0.140 | 116.623562 | -20.052506 | 2248.47  | -1803.29 |
| 6    | GUIDE  | 784990856 | 9.58 | 19913 | -0.021 | -0.114 | 0.117 | 0.187 | 116.136185 | -19.260673 | -1018.83 | -2229.45 |
| 7    | GUIDE  | 785009872 | 9.75 | 19917 | 0.157  | 0.095  | 0.105 | 0.169 | 117.686684 | -19.483349 | 1764.68  | 2312.14  |

## 2.4 Star Slots

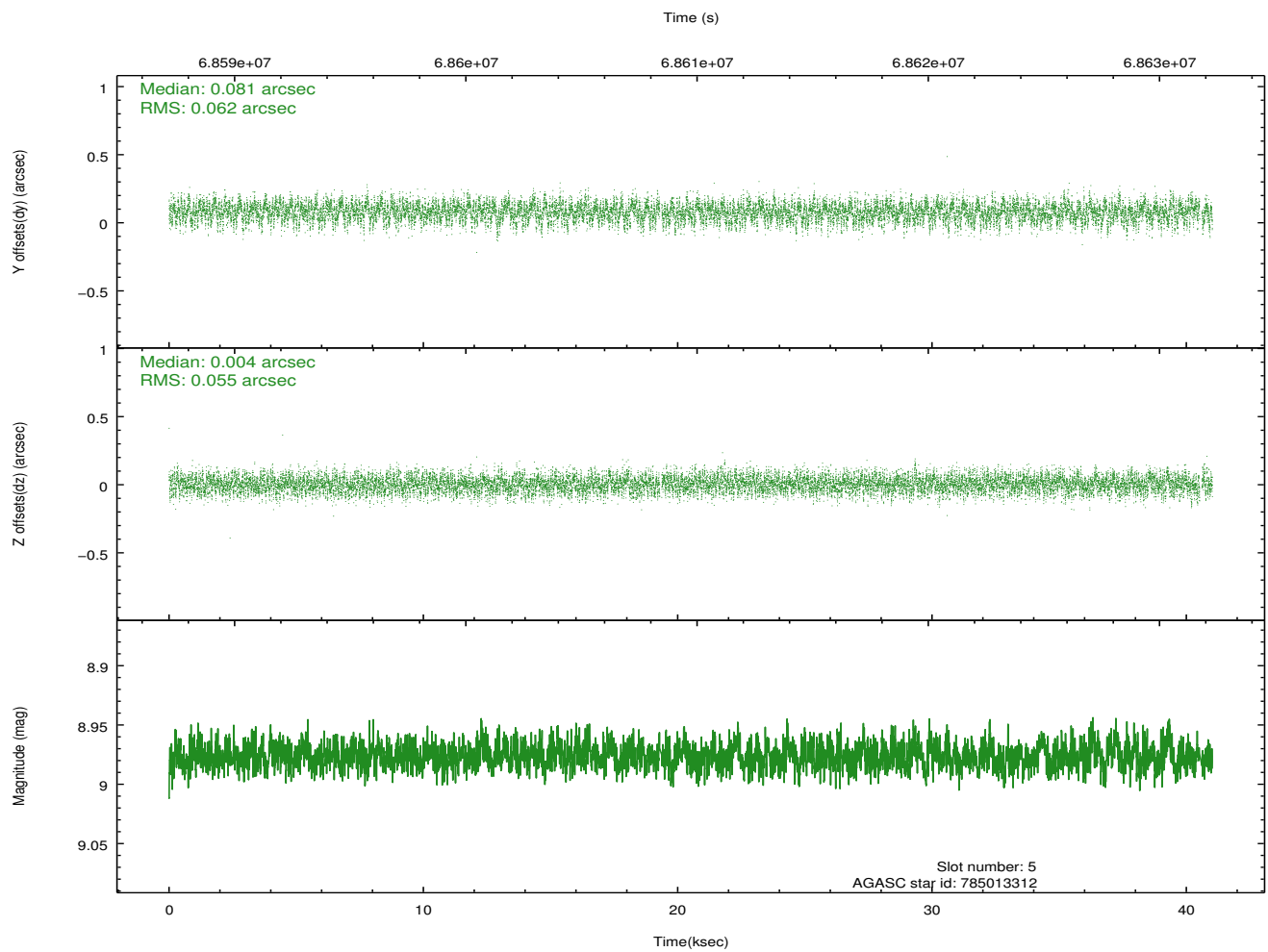
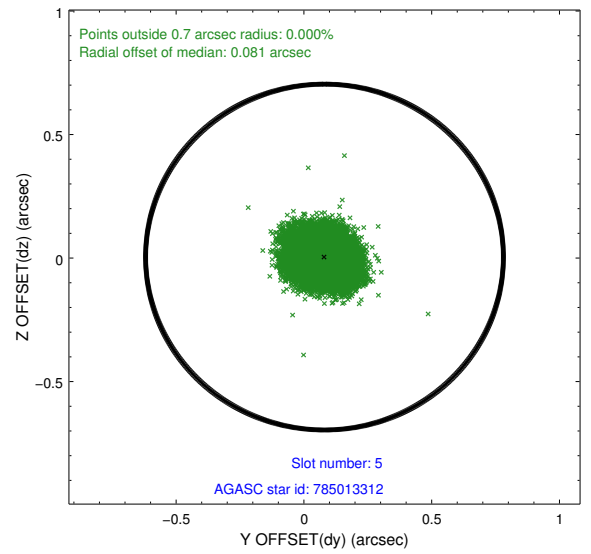
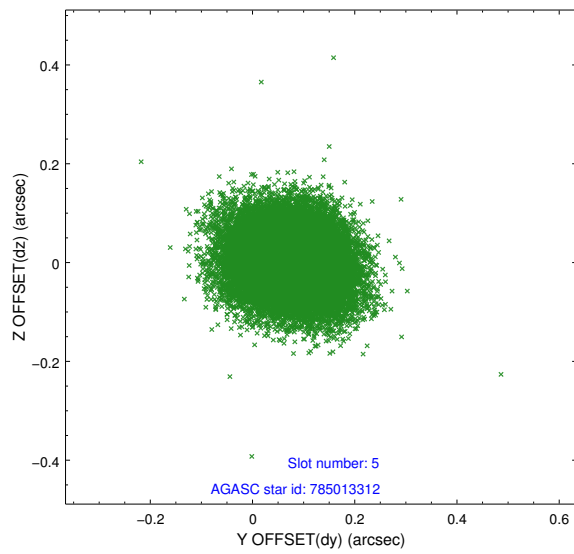
### 2.4.1 Slot 3



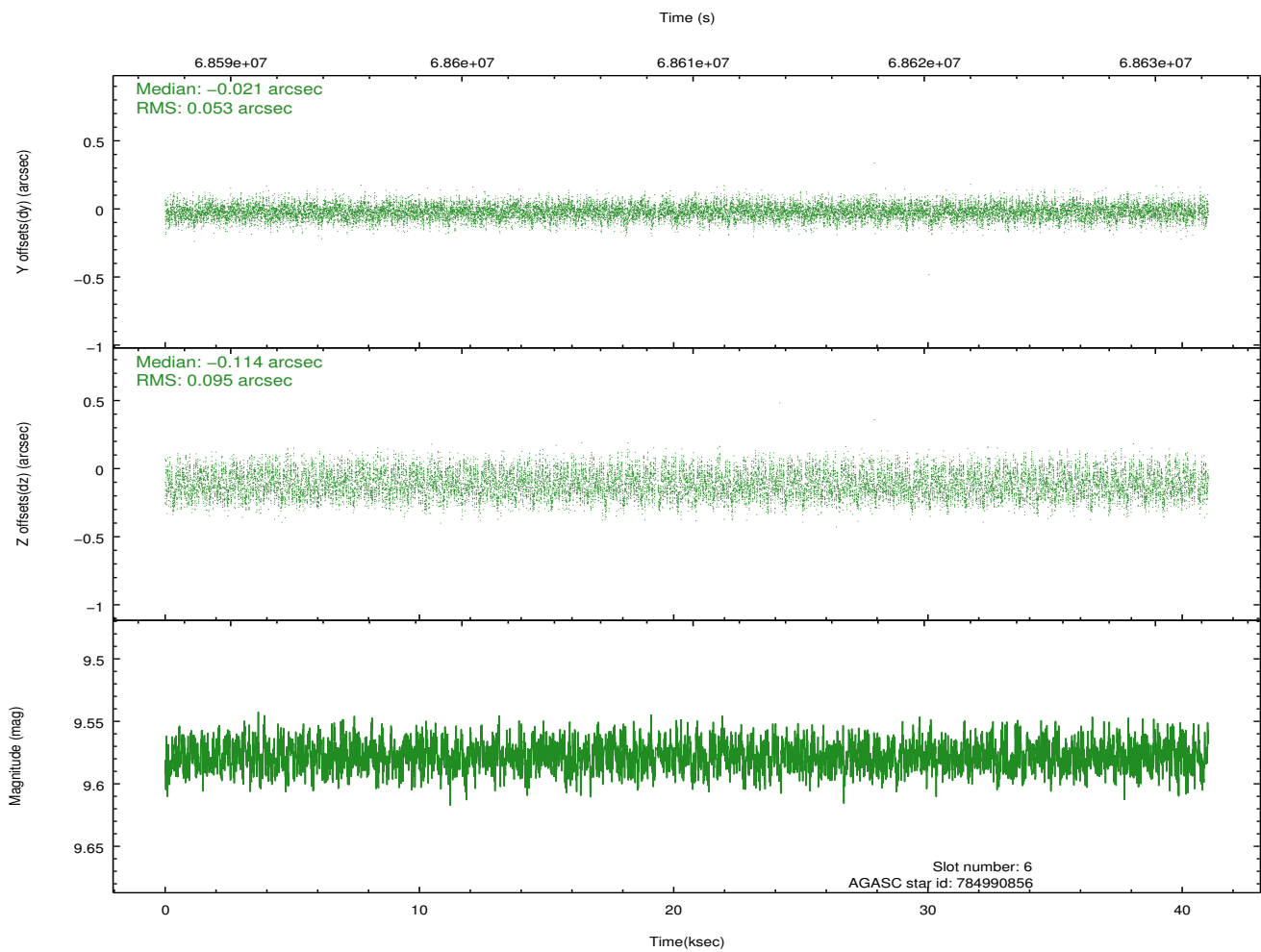
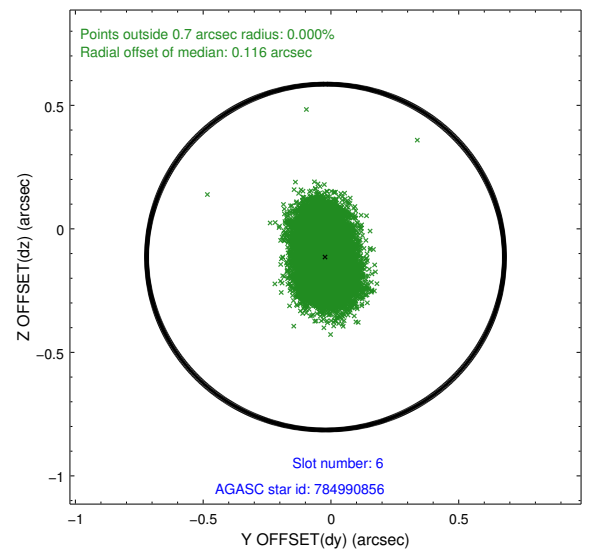
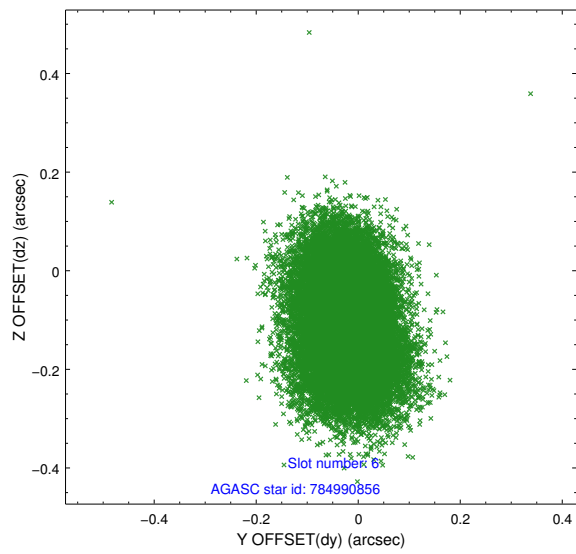
## 2.4.2 Slot 4



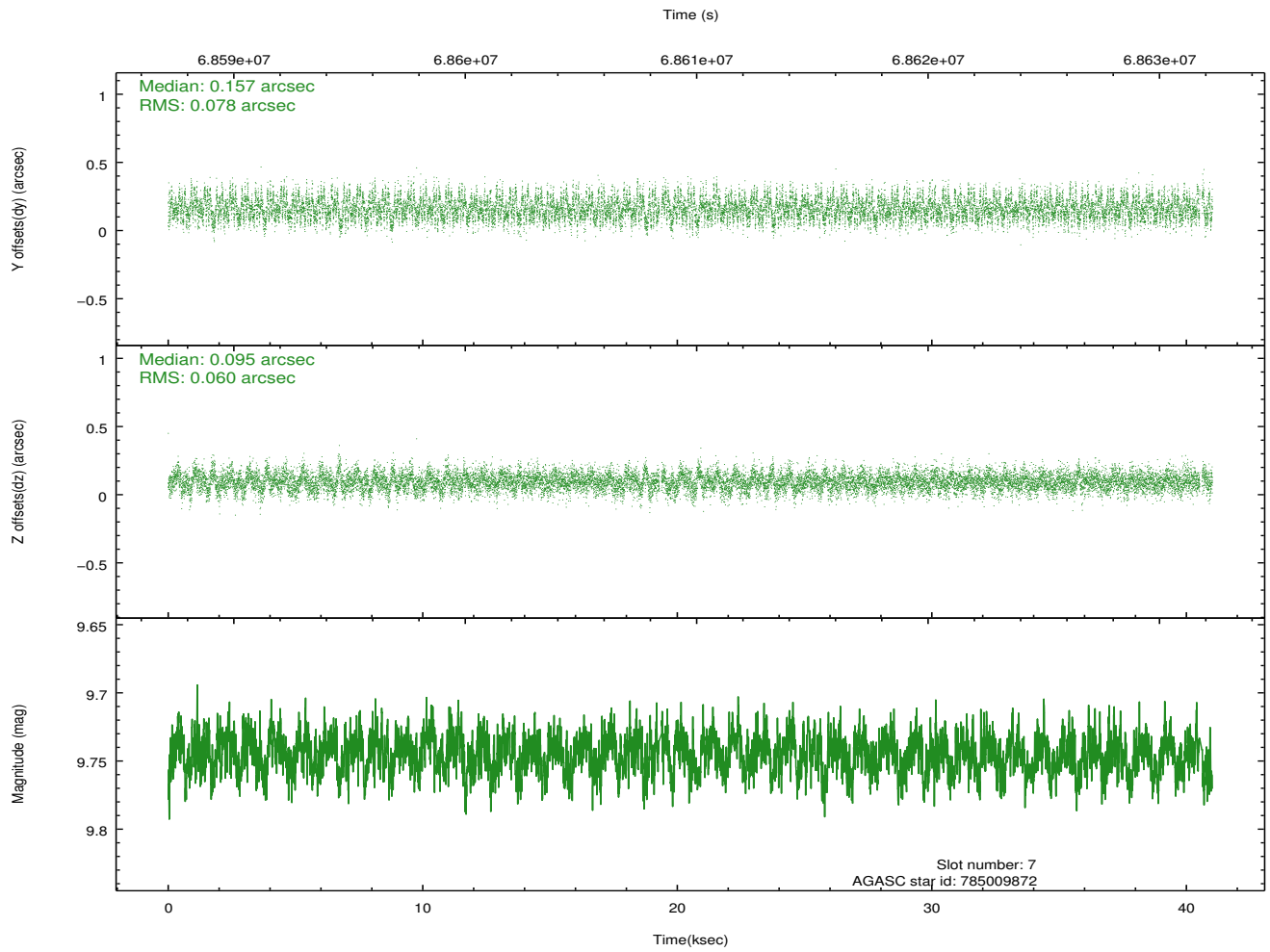
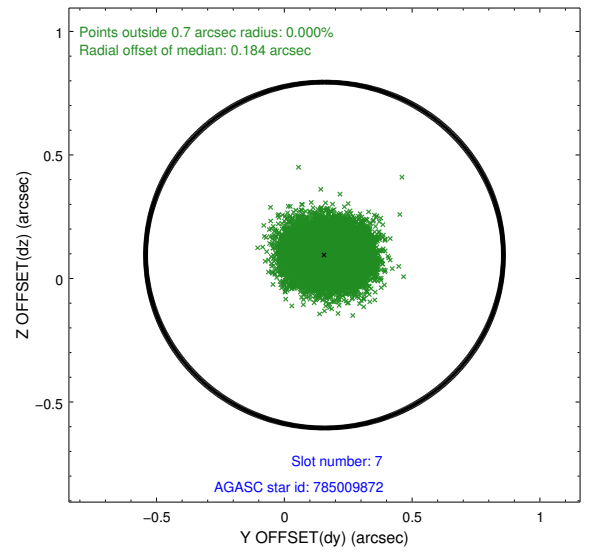
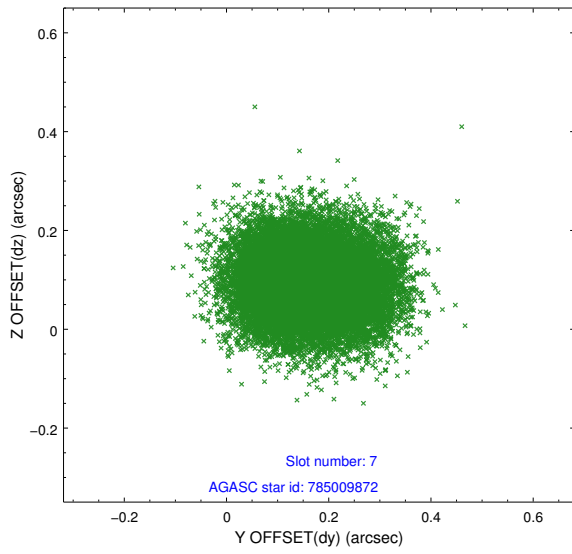
### 2.4.3 Slot 5



## 2.4.4 Slot 6

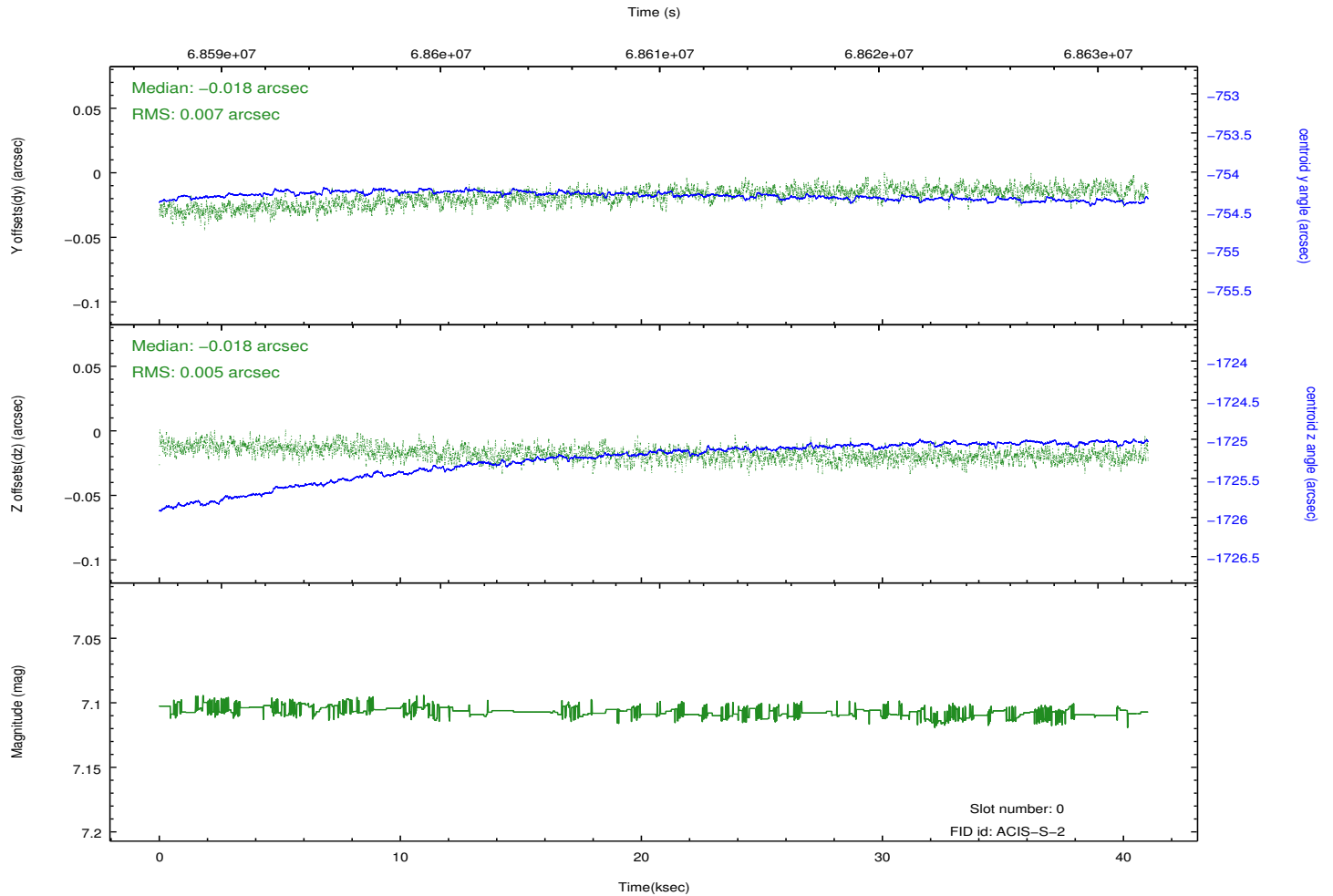
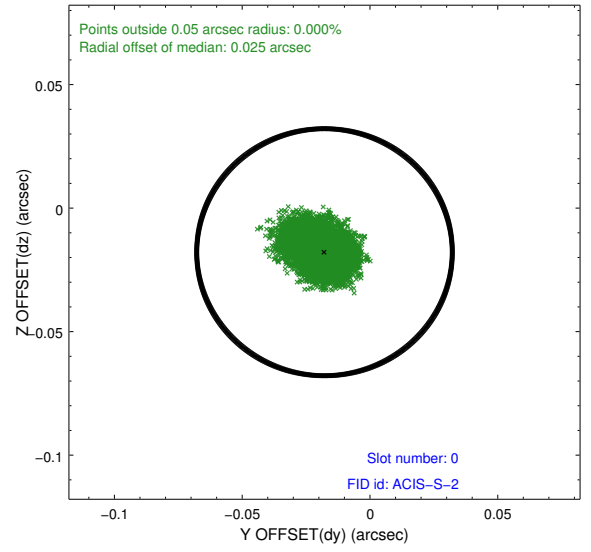
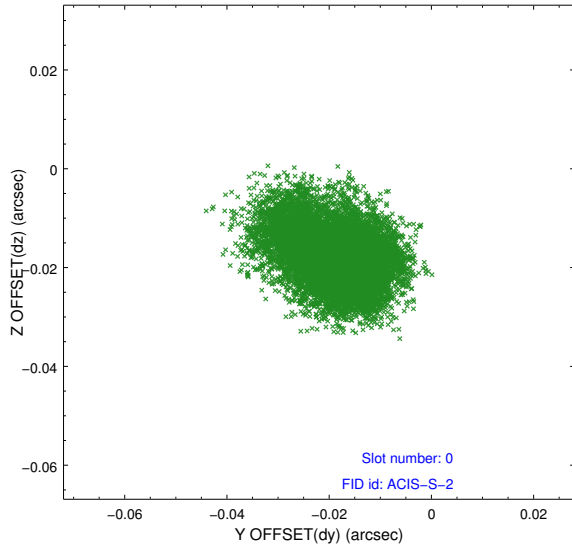


### 2.4.5 Slot 7

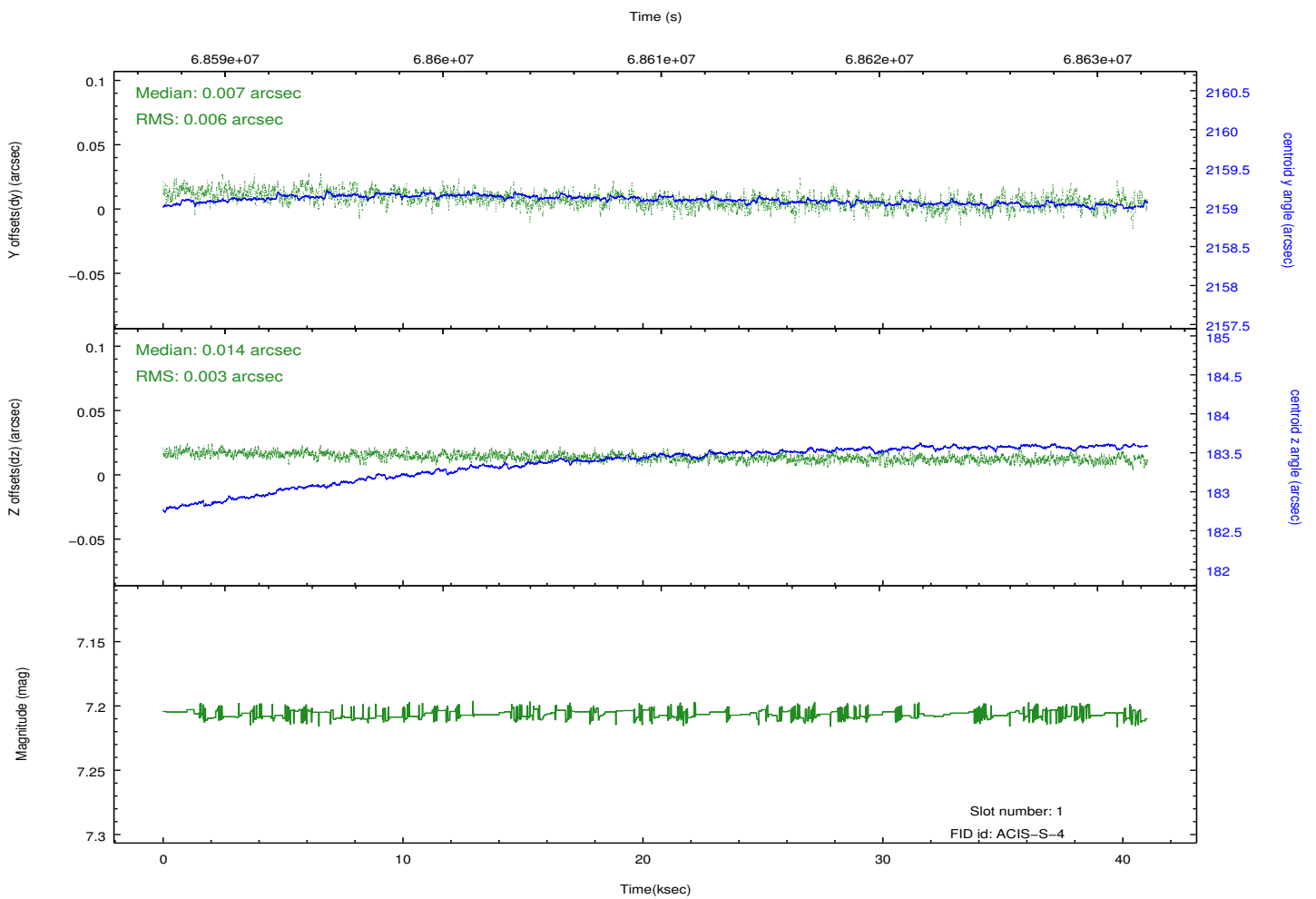
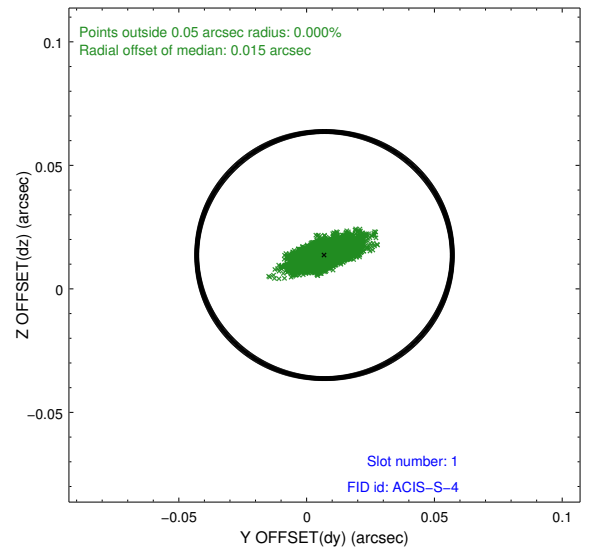
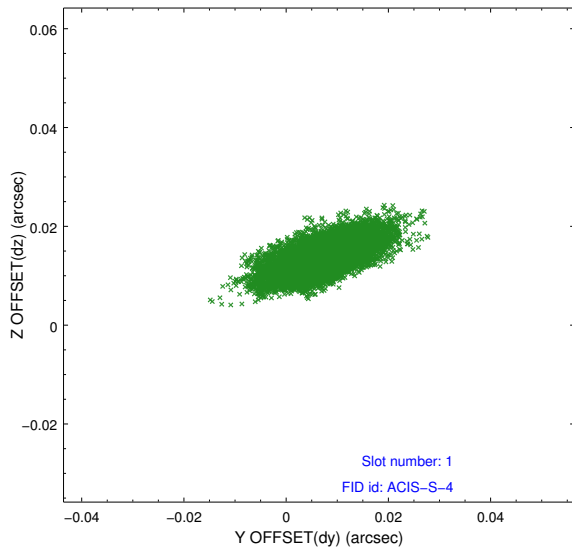


## 2.5 FID Slots

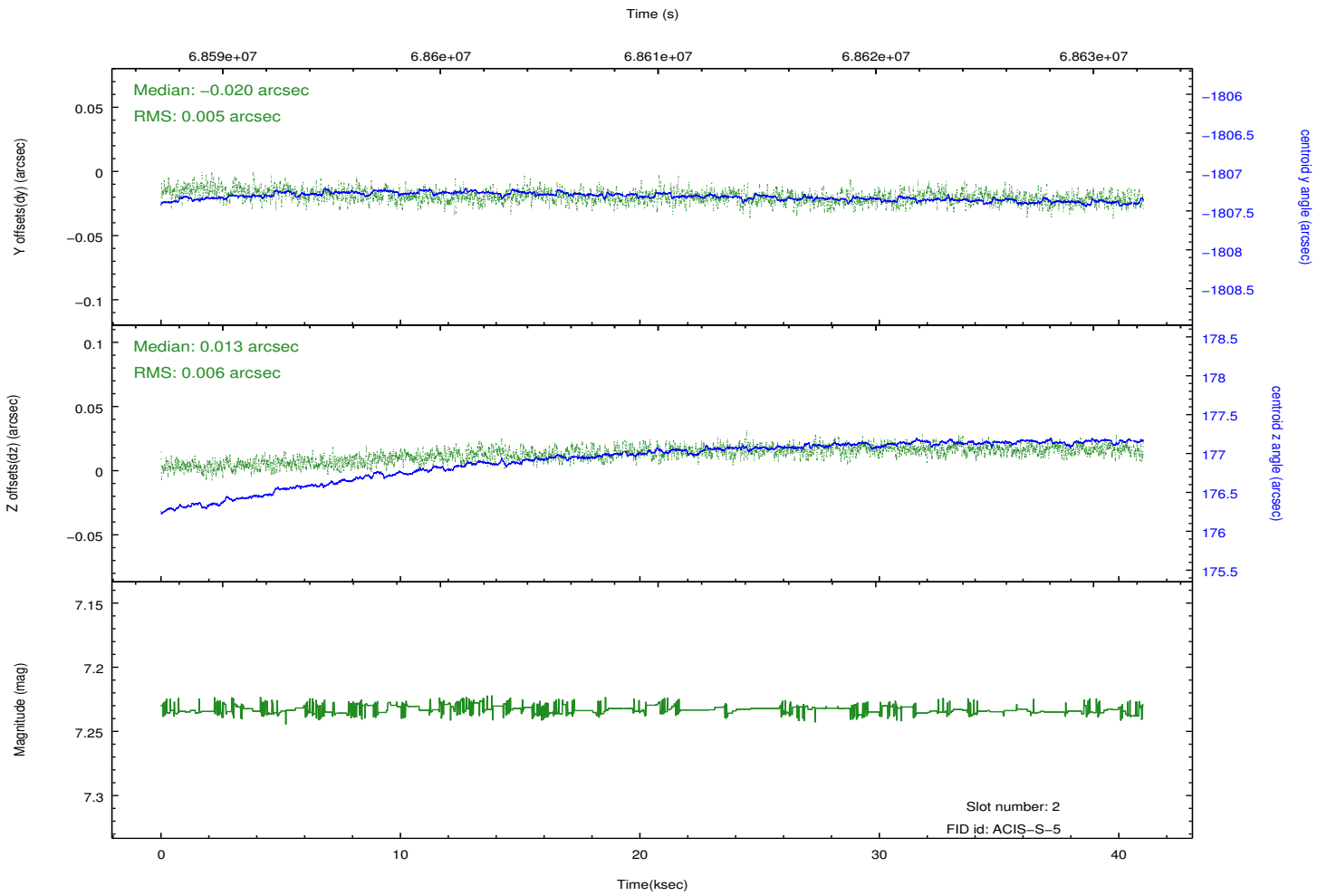
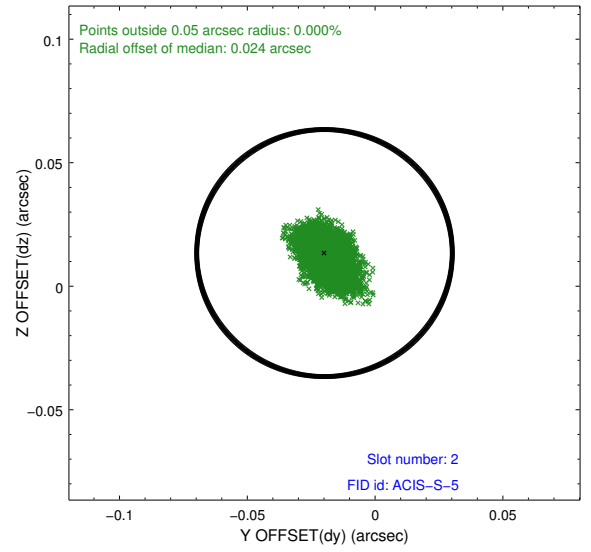
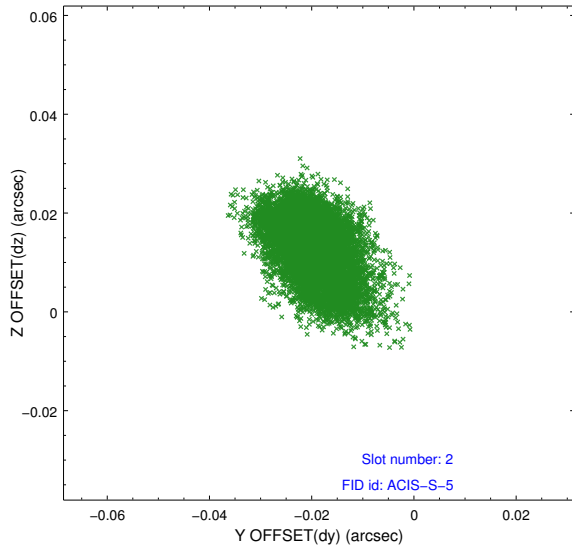
### 2.5.1 Slot 0



## 2.5.2 Slot 1



### 2.5.3 Slot 2

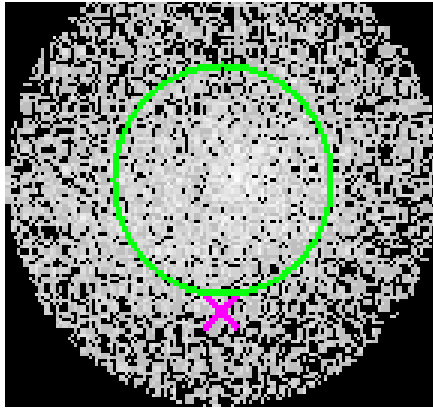


# 3 Gratings

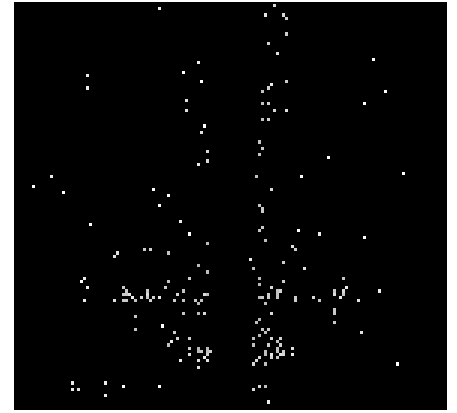
## 3.1 HEG Arm



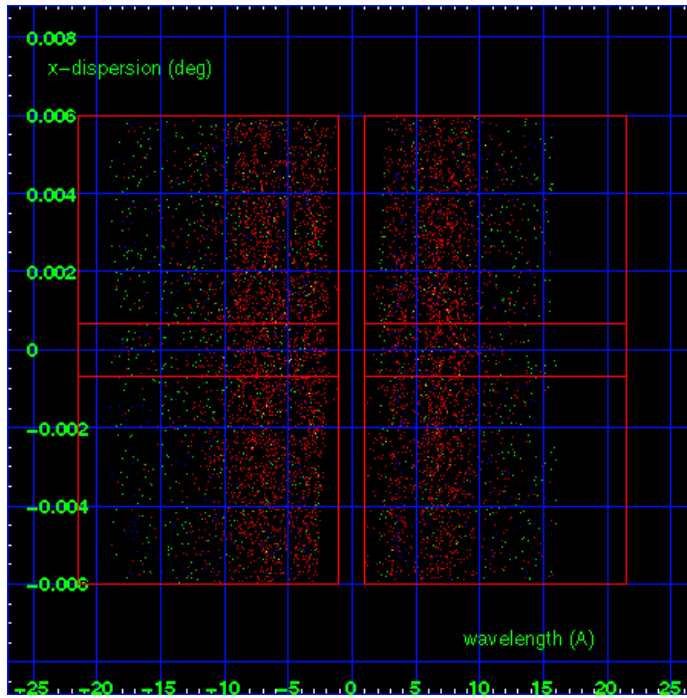
HEG Order Sort 123



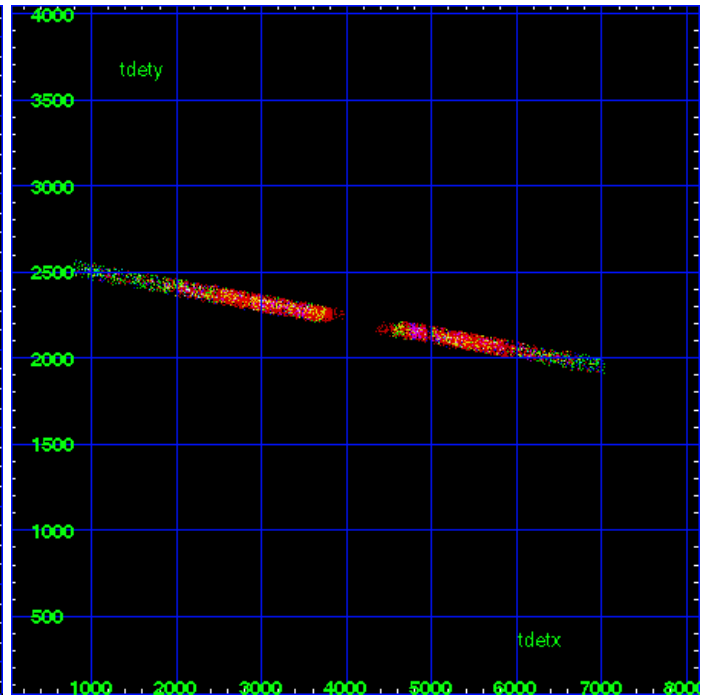
HEG Zero Order



HEG Order Sort ALL

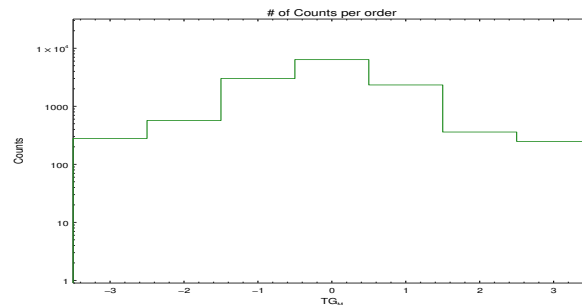


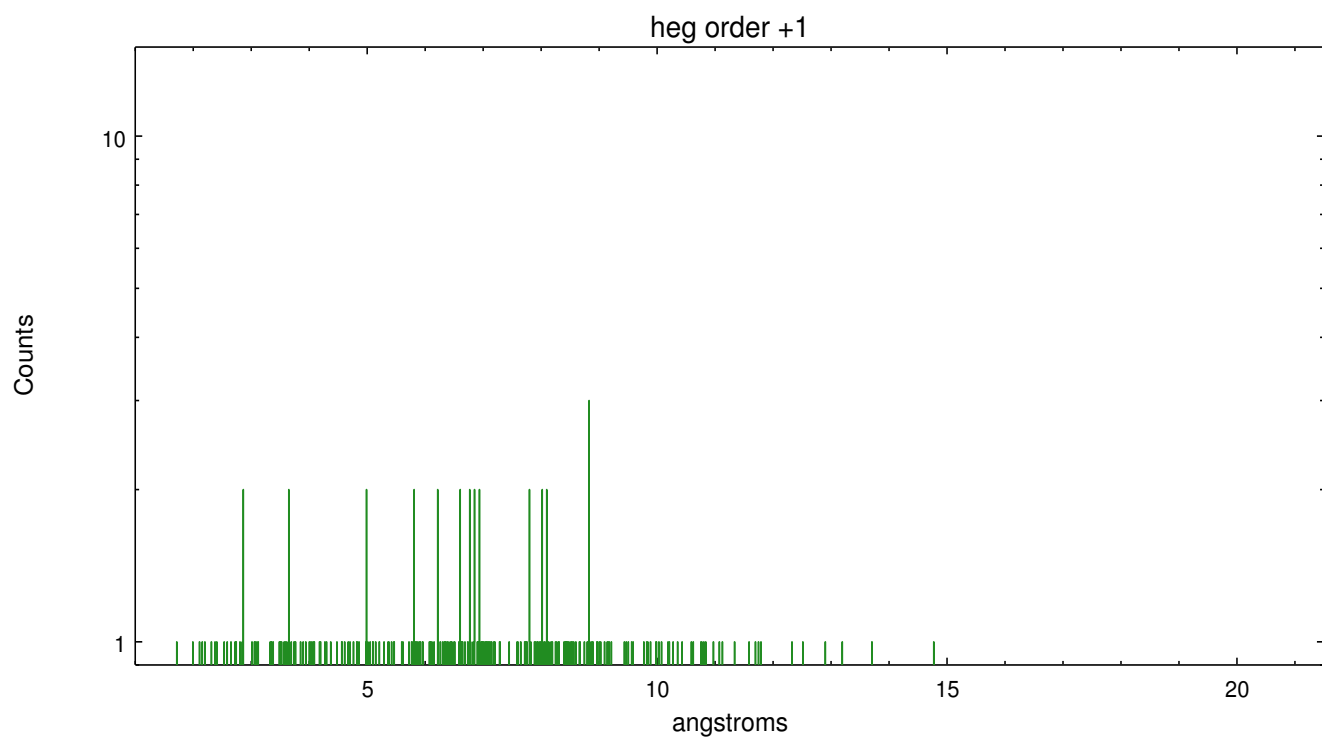
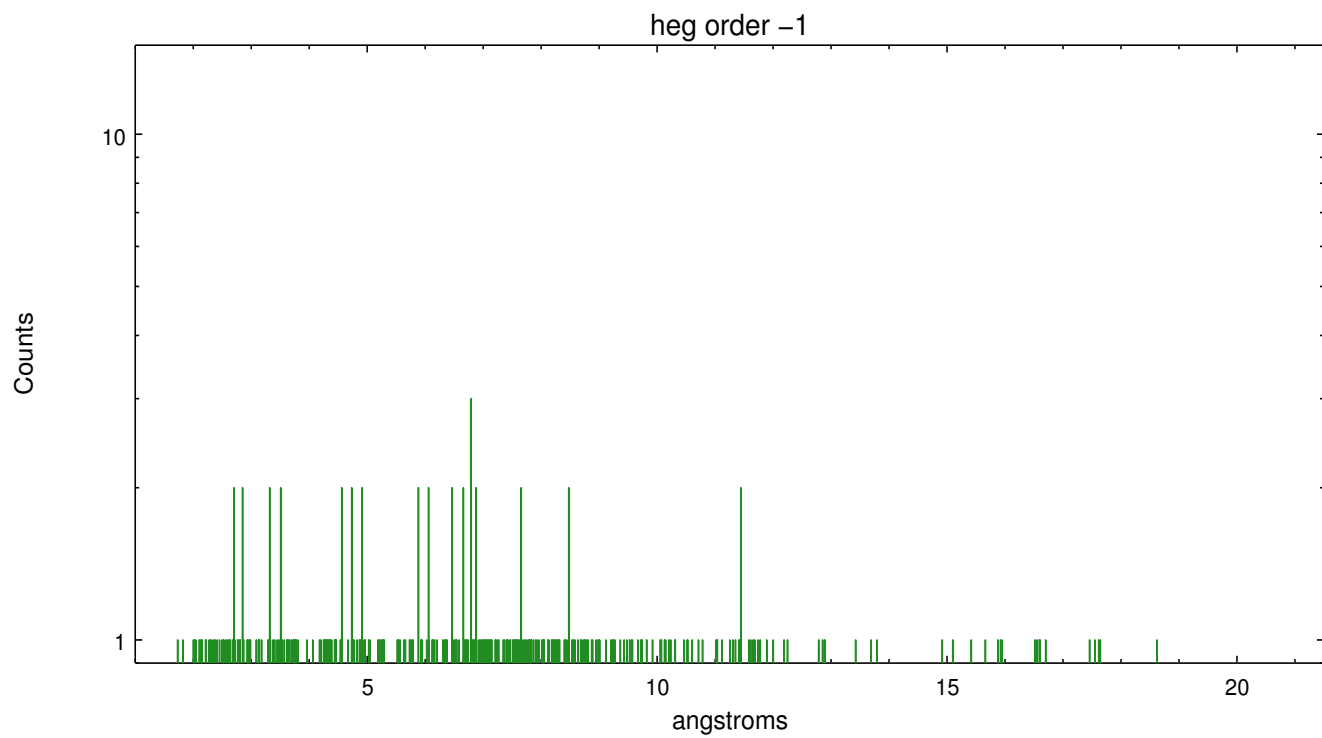
Spot Image HEG



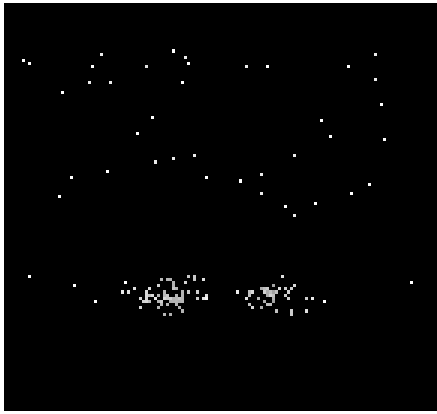
Full Detector HEG

|        | order<br>-3 | order<br>-2 | order<br>-1 | order<br>0 | order<br>1 | order<br>2 | order<br>3 |
|--------|-------------|-------------|-------------|------------|------------|------------|------------|
| Events | 279         | 569         | 3003        | 6369       | 2331       | 360        | 248        |

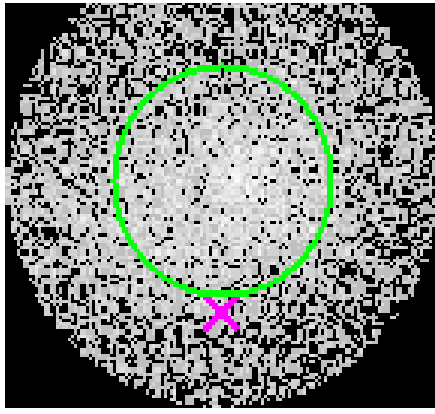




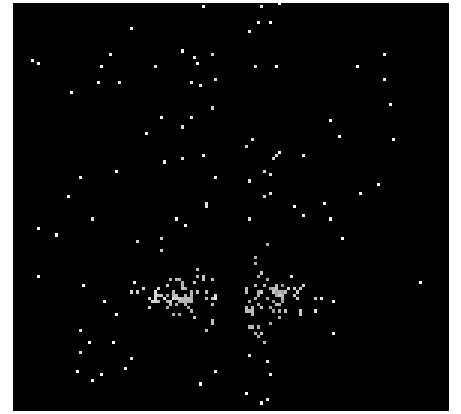
### 3.2 MEG Arm



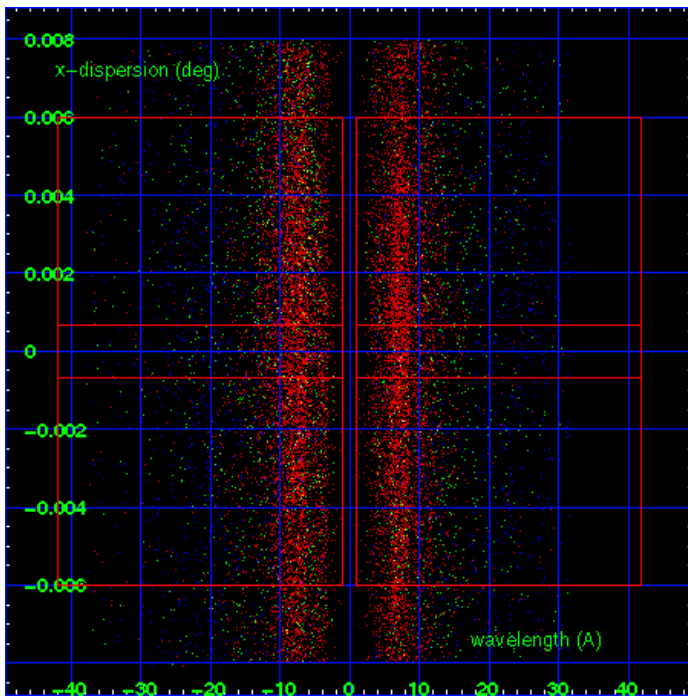
MEG Order Sort 123



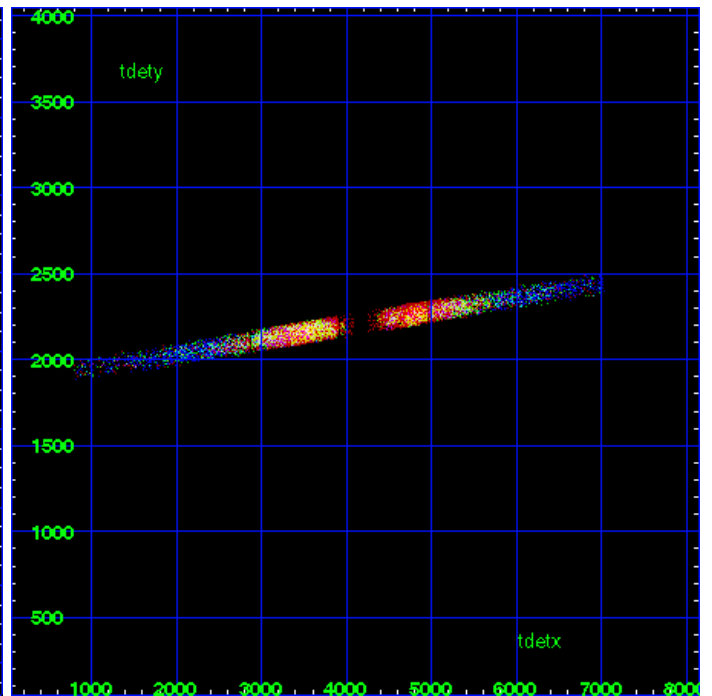
MEG Zero Order



MEG Order Sort ALL

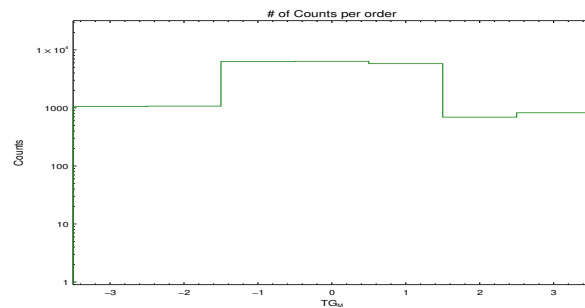


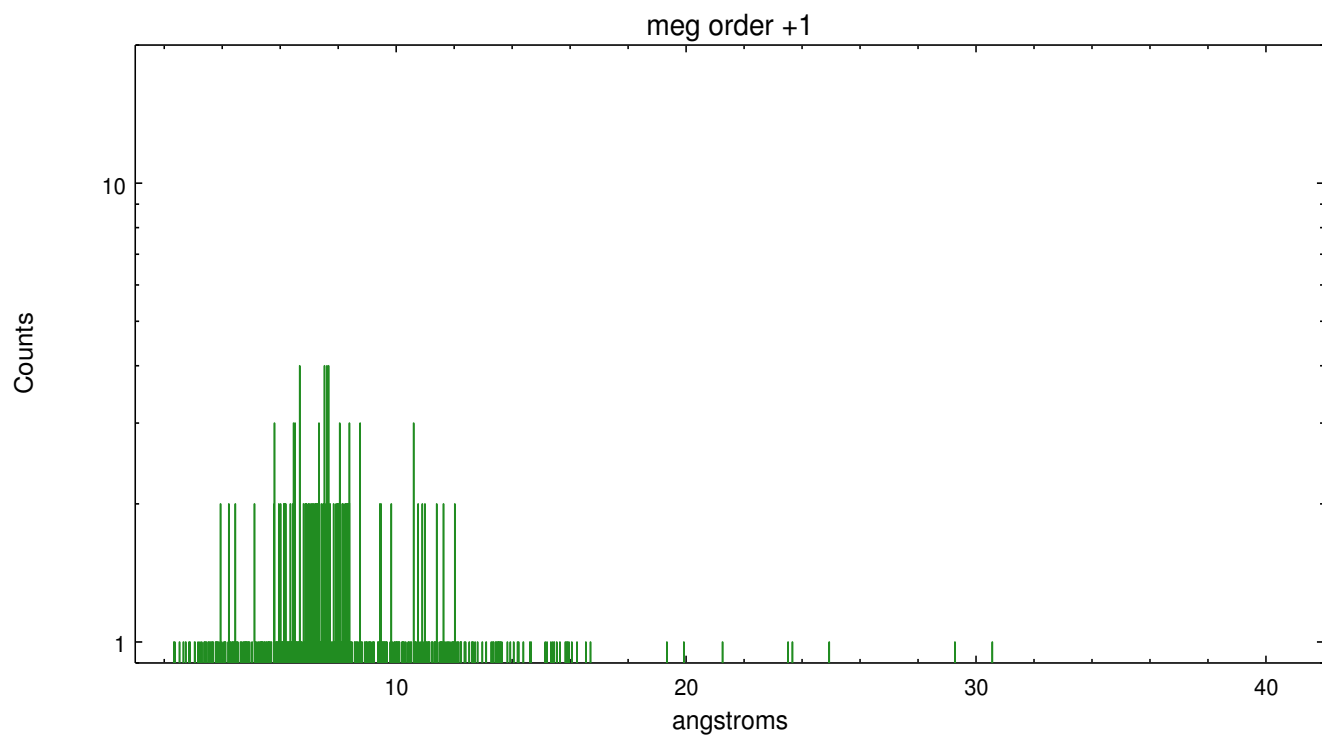
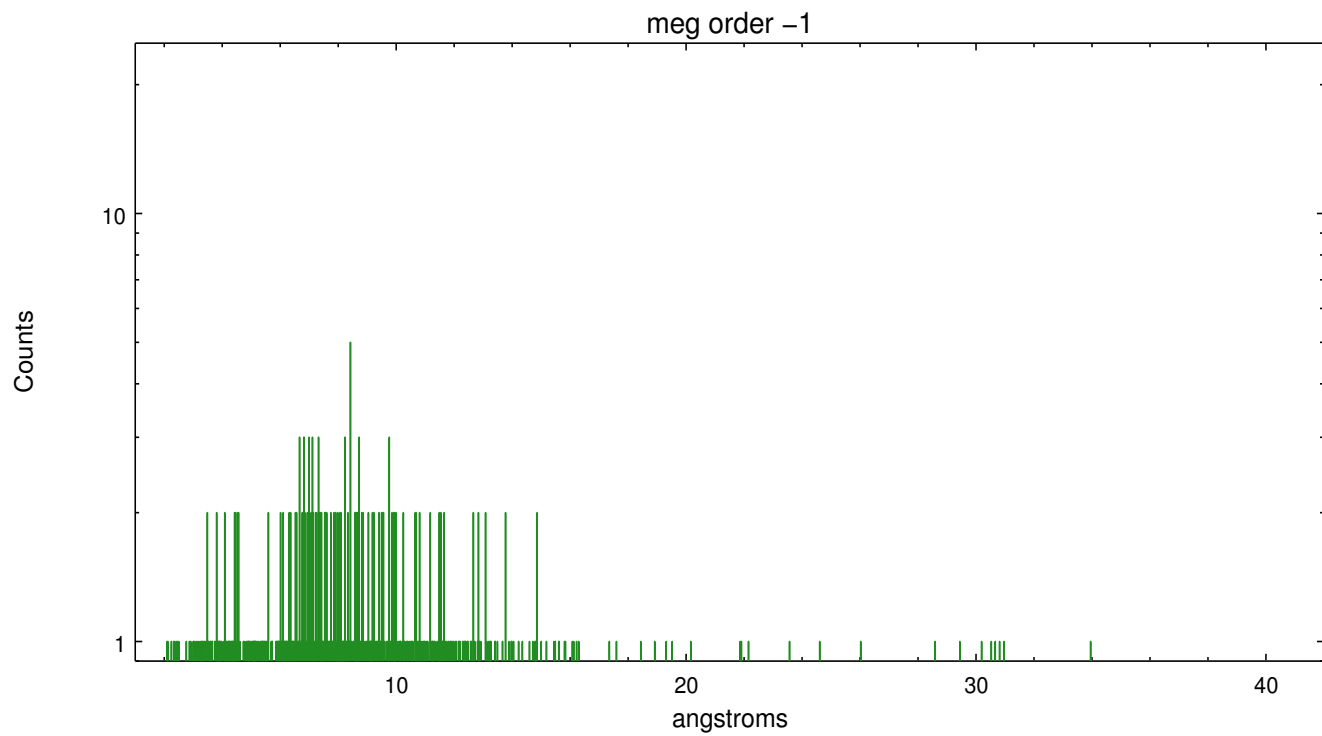
Spot Image MEG



Full Detector MEG

|        | order<br>-3 | order<br>-2 | order<br>-1 | order<br>0 | order<br>1 | order<br>2 | order<br>3 |
|--------|-------------|-------------|-------------|------------|------------|------------|------------|
| Events | 1055        | 1074        | 6282        | 6369       | 5789       | 693        | 825        |





# A Summary

## A.1 Status

|                            |             |
|----------------------------|-------------|
| V&V Scientist              | Joy Nichols |
| V&V Date (YYYY-MM-DD)      | 2012.08.27  |
| V&V Edition                | 1           |
| V&V Disposition and Status | OK          |
| V&V Charge Time            | 39.893      |

## A.2 Comments

Standard software processing technique using the tool `tgdetect` failed to determine an accurate position for the zeroth order for this observation. The source is extended and asymmetric. The processing software defaulted to the coordinates supplied by the user for the position of the zeroth order for the grating spectral extraction. For grating analysis of localized X-ray emission within the extended emission, the investigator will need to extract one or more dispersed spectra using user-defined zeroth order positions for all positions of interest.

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WARNING: there are no standard `ciao` tools for analysis of grating spectra from extended sources. The shape of an emission 'line' will be the shape of the zero order spatial structure convolved with the instrumental LSF. Grating extractions can be used, but need to be combined with custom spatial-spectral analysis, since wavelength is multi-valued at any particular diffraction angle.